AEROLOGICAL OBSERVATIONS

By RICHMOND T. ZOCH

Free-air temperatures were mostly above normal at Broken Arrow and Ellendale and in the lower levels at Royal Center. At Due west and Groesbeck and in the upper levels at Royal Center they were mostly below normal. In all cases the departures were small.

Free-air relative humidities were mostly below normal at Broken Arrow, Due West, and Royal Center. At Ellendale and Groesbeck they were mostly above normal.

Free-air vapor pressures were above normal at Ellendale and in the upper levels at Broken Arrow and Royal Center. At Due West and Groesbeck and in the lower levels at Broken Arrow and Royal Center the free-air vapor pressures were below normal.

Free-air resultant winds were variable in the lower levels. At the 3,000-meter level, and above, they were predominately westerly.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during August, 1930*

TEMPERATURE (° C.)

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	25.8	−0.9	23.9	−1.6	21.2	+1.0	24.3	−2.5	23.4	−0.1
500	25.8	+0.5	22.3	−0.7	20.9	+0.9	23.6	−0.7	22.2	+1.0
1,000	23.8	+0.9	20.0	0.0	19.4	+1.3	23.2	+1.0	19.2	+1.2
1,500	20.5	+0.7	16.5	−0.4	16.9	+1.4	19.8	+0.3	15.5	+0.4
2,000	17.0	+0.6	12.6	−1.1	13.7	+1.1	16.3	−0.3	12.0	−0.3
2,500	13.8	+0.8	8.9	−1.7	10.2	+0.6	------	------	8.3	−1.4
3,000	10.9	+1.1	5.3	−2.4	6.9	+0.3	------	------	4.9	−2.0
4,000	5.4	+1.7	0.2	−1.8	0.4	−0.4	------	------	0.3	−1.3
5,000	------	------	------	------	−4.8	+0.1	------	------	−4.7	−1.1

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during August, 1930*—Continued

RELATIVE HUMIDITY (%)

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	64	−3	70	+1	63	−3	81	+8	62	−5
500	57	−7	65	−5	63	−1	76	+2	54	−12
1,000	52	−9	61	−9	58	0	51	−11	54	−13
1,500	54	−7	62	−8	57	0	58	−2	58	−7
2,000	57	−6	65	−4	57	+2	66	+7	60	−1
2,500	60	−3	67	−1	56	+2	------	------	62	+7
3,000	61	−2	70	+3	55	+1	------	------	68	+17
4,000	59	+4	72	+1	56	+6	------	------	42	−4
5,000	------	------	------	------	53	+7	------	------	25	−19

VAPOR PRESSURE (*mb.*)

Surface	21.02	−1.97	20.82	−1.60	15.26	+0.12	24.58	−0.75	17.51	−1.74
500	18.89	−1.54	17.68	−1.94	15.01	+0.25	21.90	−0.30	14.47	−2.33
1,000	15.52	−1.18	14.36	−2.00	12.56	+0.70	14.39	−2.14	12.15	−1.90
1,500	13.46	−0.43	11.83	−1.69	10.58	+0.76	13.36	−0.18	10.38	−1.05
2,000	11.36	−0.24	9.68	−1.26	8.62	+0.73	12.19	+1.00	8.76	−0.13
2,500	9.72	+0.37	7.76	−1.05	6.69	+0.27	------	------	7.32	+0.67
3,000	8.16	+0.69	6.18	−1.02	5.44	+0.12	------	------	6.43	+1.33
4,000	5.37	+1.30	3.44	−1.74	3.82	+0.34	------	------	3.74	+0.50
5,000	------	------	------	------	2.66	+0.51	------	------	2.84	+0.85

TABLE 2.—*Free-air data obtained at naval air stations during August, 1930*

Altitude (meters) m. s. l.	TEMPERATURE (°C.)					RELATIVE HUMIDITY (%)				
	Hampton Roads, Va.	Pensacola, Fla.	San Diego, Calif.	Seattle, Wash.	Washington, D. C.	Hampton Roads, Va.	Pensacola, Fla.	San Diego, Calif.	Seattle, Wash.	Washington, D. C.
Surface	24.4	24.7	23.1	21.2	21.5	69	86	73	60	68
500	21.7	24.0	21.0	16.8	21.0	62	74	69	68	58
1,000	19.7	21.2	23.8	14.8	19.1	57	70	38	63	53
2,000	12.5	14.4	20.5	10.4	13.1	60	71	32	51	56
3,000	6.8	8.7	13.2	4.2	6.7	41	62	37	33	56
4,000	------	------	------	−4.1	0.4	------	------	------	33	56

TABLE 3.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 7 a. m. (E. S. T.) during August, 1930*—Continued

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groebeck, Tex. (139 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (65 meters)		Key West, Fla. (11 meters)		Los Angeles, Calif. (145 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°	
Surface	S 18 W	1.8	S 5 W	1.6	N 83 W	2.6	N 4 E	0.3	S 38 E	0.4	S 14 W	1.8	S 54 E	0.1	N 36 W	1.0	S 59 E	1.0	N 69 W	1.6
500	S 14 W	7.5	S 48 W	3.3	------	------	N 22 W	1.0	S 46 E	1.2	S 38 W	8.4	------	------	N 22 W	1.9	S 55 E	2.5	E	1.1
1,000	S 36 W	6.8	N 78 W	3.5	------	------	N 28 W	1.6	S 3 E	3.2	S 30 W	6.7	S 46 E	0.9	N 7 W	1.4	S 41 E	2.5	S 56 E	1.2
1,500	S 48 W	4.7	N 80 W	5.0	------	------	N 35 W	1.9	S 57 W	1.9	S	3.4	S 44 W	1.9	N 19 W	2.0	S 29 E	1.2	S 19 W	1.8
2,000	S 58 W	3.3	N 65 W	6.0	N 85 W	3.9	N 26 W	2.4	N 87 W	2.5	S 32 E	1.4	S 85 W	2.3	N 35 W	1.7	S 37 E	0.7	S 43 W	3.7
2,500	S 58 W	2.5	N 67 W	7.1	W	3.9	N 42 W	2.5	N 69 W	3.3	N 81 E	1.3	N 89 W	3.1	N 43 W	2.0	S 35 W	0.9	S 29 W	5.1
3,000	N 88 W	2.4	N 63 W	9.4	S 87 W	3.4	N 46 W	2.7	N 56 W	4.4	N 57 E	1.7	S 80 W	3.9	N 76 W	2.5	S 57 W	1.3	S 18 W	6.8
4,000	S 81 W	0.3	N 56 W	7.9	S 84 W	7.6	N 37 W	3.5	N 63 W	7.2	S 65 E	3.1	S 78 W	7.4	N 78 W	4.5	S 75 W	1.1	S	4.4
5,000	N 23 W	1.5	------	------	------	------	N 58 W	4.1	N 58 W	8.5	N 43 E	4.1	S 76 W	7.3	N 88 W	5.1	W	1.6	------	------

Altitude (meters) m. s. l.	Medford, Oreg. (410 meters)		Memphis, Tenn. (145 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (321 meters)		Royal Center, Ind. (225 meters)		Salt Lake City Utah (1,294 meters)		San Francisco, Calif. (2 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. Wash. (14 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°	
Surface	S 56 W	0.5	S 41 E	0.5	N 7 E	0.4	S 60 E	1.5	S 53 E	0.6	S 52 E	2.5	N 78 W	4.0	N 17 W	0.6	S 31 E	0.3	S 36 E	0.
500	N 89 W	0.8	S 52 W	2.3	N 61 W	1.4	S 21 E	4.4	S 6 E	1.1	------	------	N 62 W	5.3	N 31 W	1.9	S 80 E	0.4	N 14 W	2.6
1,000	N 60 W	1.2	N 82 W	2.1	S 63 W	1.0	S 5 W	5.4	N 65 W	2.1	------	------	N 49 W	3.8	N 49 W	4.8	N 65 E	0.3	N 30 W	2.3
1,500	S 72 E	0.5	N 57 W	2.7	S 6 E	0.6	S 46 W	4.3	N 52 W	3.7	S 22 E	5.0	N 89 W	2.4	N 47 W	4.6	N 70 W	0.6	N 35 W	4.0
2,000	S 56 E	1.7	N 47 W	3.5	S 28 E	0.8	S 70 W	4.6	N 49 W	5.1	S	4.9	S 45 W	3.7	N 40 W	5.9	S 77 W	1.1	N 38 W	6.1
2,500	S 5 W	3.4	N 39 W	3.3	N 89 E	1.3	N 85 W	5.9	N 44 W	6.0	S 31 W	3.4	S 28 W	4.6	N 44 W	7.1	S 47 W	1.3	N 58 W	6.5
3,000	S 11 W	5.5	N 18 W	3.3	N 37 E	1.4	N 82 W	6.4	N 44 W	6.9	S 54 W	4.0	S 32 W	5.8	N 40 W	8.0	S 19 W	2.4	N 58 W	6.3
4,000	S 39 W	8.7	N 47 W	5.0	N 49 E	3.1	N 71 W	6.1	N 46 W	9.3	S 53 W	4.4	S 30 W	8.1	------	------	------	------	N 66 W	6.3
5,000	------	------	------	------	N 20 E	3.2	N 53 W	5.7	N 50 W	12.0	------	------	S 38 W	11.1	------	------	------	------	------	------

TABLE 4.—*Observations by means of kites, captive and limited-height sounding balloons during August, 1930*

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center, Ind.
Mean altitudes (meters), m. s. l., reached during month	2,755	2,576	2,866	1,873	3,058
Maximum altitude (meters), m. s. l., reached and date	[1] 4,381	[2] 4,641	[3] 6,528	[4] 2,366	[5] 8,201
Number of flights made	29	31	31	20	27
Number of days on which flights were made	29	31	31	20	27

[1] 20th. [2] 18th. [3] 24th. [4] 31st. [5] 26th; captive balloon breakaway; next highest flight at Royal Center was a kite flight to 6,130 meters on the 21st.

In addition to the above there were approximately 130 pilot balloon observations made daily at 56 Weather Bureau stations in the United States.

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By M. C. BENNETT

GENERAL SUMMARY

The weather for August was extremely hot almost everywhere during the first decade, but as it ended cool weather overspread the central and northern districts, and light frosts were reported on the 13th in southern New York, western Pennsylvania, and West Virginia. During the remainder of the month the weather was cool in most sections from the Rocky Mountains eastward, except temperatures above normal prevailed in the western Great Plains and northwestern Rocky Mountain areas. The month as a whole was warmer than normal except in northern New England, New Jersey, West Virginia, the South Atlantic States, and the far Southwest.

While moderate to substantial showers were received over limited areas during the month, which relieved the severe droughty conditions in some sections, the month generally had very scanty rainfall, and the severe drought remained largely unbroken. The deficiencies in precipitation for the month were widespread, with every State east of the Rocky Mountains, except South Dakota and Nebraska, receiving less than normal. The areas of greatest deficiency for the month were in the Northern and Southeastern States, where droughty conditions had not been so generally severe during July. The least rainfall of August record was received this month in Minnesota, Pennsylvania, Maryland, and Virginia.

TEMPERATURE

While marked changes occurred in most sections, yet August, as a whole, was considerably hotter than normal. The first decade temperature, especially, was a continuation of the situation of the latter half of July, all districts save a few southwestern, southeastern, and northeastern having temperatures moderately to decidedly above normal.

The middle of the month was notable for cool weather for summer in a great many regions, yet the Plains States and the Northwest remained decidedly hot. The first half of the final decade was cool in the eastern half of the country, but hot over most of the western half, especially in the northern Rocky Mountain region. The last few days of the month were hotter than normal over nearly all the country, especially from the upper Mississippi Valley eastward to the Middle Atlantic States.

August averaged cooler than normal only near the Atlantic and east Gulf coasts and in the southern Appalachian region, and over considerable portions of California, Arizona, and Nevada. In other regions the month averaged warmer than normal, and generally from 2° to 5° warmer in the northern Rocky Mountain region, the Missouri and upper Mississippi Valleys, and the upper Lake region. In North Dakota the month was as hot as any preceding August of record.

In all States east of the Mississippi River, and in almost all Middle and Northern States to westward, the highest temperatures occurred during the first decade, very often on either the 2d, 3d, or 4th. In most States which touch either the Mississippi or the Ohio River, and in several Middle Atlantic States, the highest marks of previous August records were exceeded or equaled or very closely approached. In Tennessee 113°, on the 9th, was 5° above any mark of an earlier August, and in Minnesota 109°, on the 3d, was 4° above.

In the northern and middle portions of the eastern half of the country, the drop in temperature near the end of the first decade was very pronounced, and the lowest readings of the month were noted about the 10th to 14th. In West Virginia, 112° had been recorded on the 4th, 2° above any previous state record; but only eight days later other places in the State noted 30°, 1° below any other August record.

In most of the cotton States, and most States of the western half of the country, the lowest readings of the present August occurred chiefly on or after the 20th, and only in the South Atlantic States were they noteworthy in comparison with what earlier Augusts had brought.

PRECIPITATION

Scanty precipitation, particularly over the eastern half of the country, was once more a conspicuous feature. East of the ninety-fifth meridian not one of the States received a normal amount of rainfall, and nearly one-third of them received less than 40 per cent of the normal. The scarcity of August precipitation was very marked in the more elevated portions of Georgia and South Carolina, in the interior sections of the Middle Atlantic States, and from Michigan to Minnesota.

Among the districts which had suffered great scarcity of moisture during July, the Ohio and lower Mississippi Valleys received mainly about two-thirds of the normal August quantities, so conditions improved somewhat. However, the distribution within the States was poor, also the important rains seldom came till about the middle of the month, when the possibility of benefit to staple crops had become less than it was at the close of July.

This summer has been the driest within the period well covered by records from Arkansas and Mississippi northeastward to the southern Middle Atlantic States. In Arkansas the summer June to August, brought about one-third the normal precipitation. In Kentucky the sixth months, March to August inclusive, were all deficient in precipitation, the whole period showing not quite half